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Biotechnology in the Barnyard Allows Leaner Cuts of Meat

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Although the livestock industry has made progress in reducing the amount of carcass fat, it still produces meat with a quantity of fat exceeding consumer acceptance.

Producing leaner fresh meat will benefit those consumers wanting to reduce their risk for coronary heart disease by limiting their intake of dietary saturated fatty acids and decreasing their blood levels of cholesterol.

Reducing the amount of carcass fat will also improve the efficiency of meat production (more pounds of meat from fewer pounds of feed), thereby providing a significant economic benefit to the livestock industry. Safe and effective agricultural biotechnologies in meat production are also needed to meet human nutritional needs and increasing global demands for food.

The quantity of food that must be produced to meet human nutritional needs over the next 40 years has been estimated to equal the amount of food previously produced throughout the entire history of humankind!

To help the swine industry meet these goals, research at The Pennsylvania State University has found a biotechnology that increases growth rate, enhances muscle growth, and concurrently reduces fat deposits in growing pigs.

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A CONTROL PIG (LEFT) AND A PIG TREATED WITH SOMATOTROPIN FOR 77 DAYS (RIGHT).

SOMATOTROPIN USE

Funded in part by USDA's National Research Initiative (NRI) Competitive Grants Program, the researchers discovered important benefits from a daily dose of the recombinantly derived porcine growth hormone pGH – also called somatotropin or pST. This biotechnology is based on the discovery that the naturally occurring protein hormone somatotropin

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acts as the master hormone regulating body growth.

Using somatotropin enhances muscle growth by as much as 50%, reduces fat deposits by 50-70%, increases the rate of pig growth by 10-15%, and improves production efficiency by as much as 30%.

The effects of somatotropin on carcass composition are dramatic (see illustrations). A significant increase in profitability to the swine industry ultimately results.

Somatotropin markedly affects how nutrients are used to support muscle growth and adipose (fat) tissue growth. Research has shown that somatotropin reduces the use of nutrients by adipose tissue, which in turn slows down the growth rate of the adipose tissue.

Somatotropin is the most effective biological means yet discovered for reducing fat accumulation in growing pigs. Maximally effective doses of somatotropin can reduce fat deposits by as much as 60-80%. Somatotropin acts directly on fat cells to inhibit specific genes (e.g., fatty acid enzymes) that control synthesis of fatty acids and lipids. The nutrients normally used to support adipose tissue growth are redirected to muscle, where they contribute to increased muscle growth.

IMPACTS

Because fewer nutrients are used by adipose tissue, pigs treated with somatotropin consume less feed per pound of body weight gain. This biotechnology also helps reduce environmental pollution – more nutrients are used for growth while fewer are excreted into the environment.

It has been recognized for many years that overconsumption of certain saturated fats increases the risk of coronary heart disease. Therefore, reducing fat deposits through somatotropin treatment is of potential public health significance.

Because animal products provide about 60% of the saturated fat consumed in the American diet, it is prudent that new technologies be developed that are more effective and efficient in reducing carcass fat than is the current practice of trimming excess carcass fat in the supermarket.

Developing biotechnologies that reduce carcass fat will enable consumers to include pork in their diet and still meet contemporary dietary guidelines for reducing their risk of chronic disease.

A PORK LOIN FROM A CONTROL PIG (LEFT), CONTRASTED WITH A PORK LOIN FROM A PIG TREATED WITH SOMATOTROPIN FOR 77 DAYS (RIGHT).

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The research reported in this factsheet was sponsored by the Animal Growth, Development & Nutrient Utilization Program of the Animals Division of the National Research Initiative Competitive Grants Program. To be placed on the mailing list for this publication or to receive additional information, please contact the NRI (202/401-5022 or NRICGP@reeusda.gov). The factsheet also is accessible via the NRI section of the Cooperative State Research, Education, and Extension Service website (http://www.reeusda.gov/nri).